Retinal blood vessels delineation by using *B*-COSFIRE filters with inhibition

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The inspection of retinal fundus is widely used by ophthalmic specialists for the diagnosis and monitoring of several pathologies. The automatic segmentation of the vessel tree is an important pre-processing step which facilitates subsequent diagnosis.

We present a filter that responds to vessels and that we call *B*-COSFIRE with *B* standing for bar which is an abstraction for a vessel [1]. A *B*-COSFIRE filter achieves orientation selectivity by computing the weighted geometric mean of the output of a pool of Difference-of-Gaussians filters, whose supports are aligned in a collinear manner. In order to improve the quality of the delineation output by reducing the effects of the noise that is present in the background, we propose to combine the response of center-on DoG filters (excitatory response) with the one of center-off DoG filters (inhibitory response). The output of an inhibited *B*-COSFIRE filter is computed as the subtraction of a factor of the response of the inhibitory part from the one of the excitatory part of the filter.

Evaluation of segmentation algorithms are based on pixel-to-pixel evaluation with respect to a ground truth image manually made by a human observer. Comparison of the performance of retinal vessel segmentation algorithms strictly depend on the particular ground truth data used. Thus, the results are influenced by the subjectivity of the human observer that provided the manually segmented images. We evaluate the performance of the proposed method by using the quality assessment metric proposed by [2]. This metric allows the assessment of vessel segmentation algorithms performance by considering properties of the vessels such as connectivity, area and length. It has also been demonstrated to have high matching degree with human quality perception.

References

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